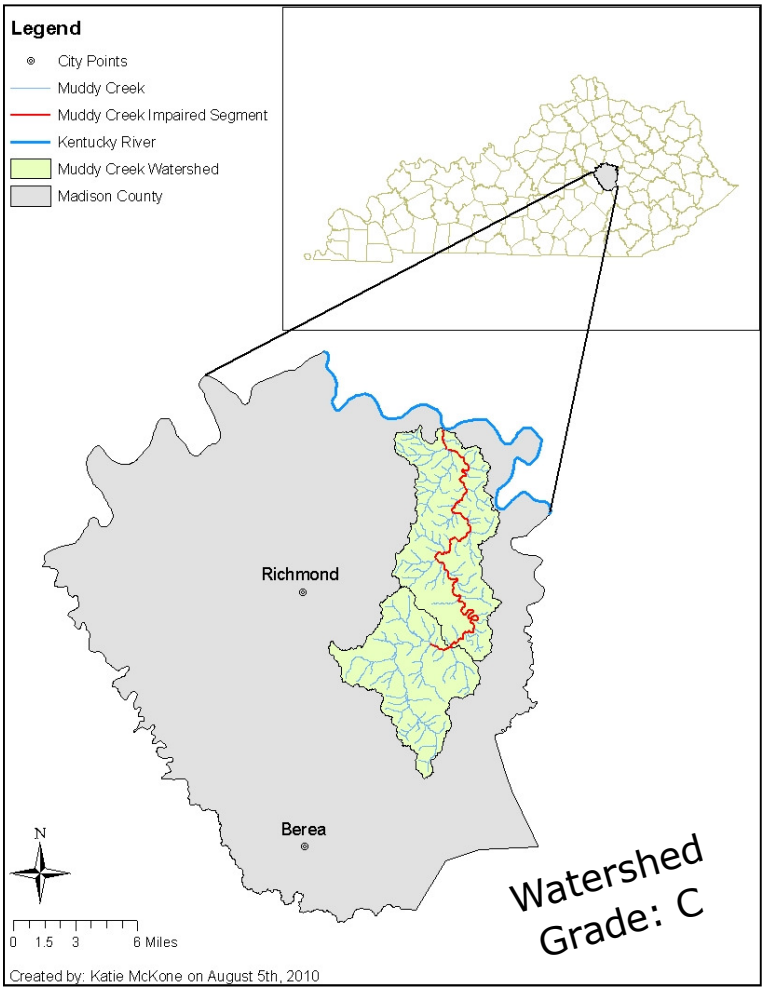
Kentucky Division of Water
200 Fair Oaks Lane, 4th Floor
Frankfort, KY 40601
Phone: 502-564-3410
Website: http://water.ky.gov/waterquality/Pages/TMDLHealthReports.aspx

Muddy Creek Watershed Health Report

Department for Environmental Protection - Division of Water



The Kentucky Division of Water (DOW) is the state agency responsible for carrying out the requirements of the Clean Water Act to reach the goal of making all waters in Kentucky safe for swimming and fishing (called **designated uses**).

DOW has developed this health report to inform the residents of Madison County of efforts to examine the health of the Muddy Creek Watershed. A **watershed** is an area of land where runoff flows to a common stream. When streams come together, the two streams' watersheds combine to make a larger watershed. Many small streams, such as Viny Fork and Clear Creek, flow into Muddy Creek. Eventually, Muddy Creek flows into the Kentucky River, and is therefore part of the Kentucky River Watershed.

Upon initial evaluation it was determined that most of Muddy Creek does not support all of the **designated uses** required by the Clean Water Act (colored red on the map). The U.S. Environmental Protection Agency (EPA) requires that states conduct watershed studies on all such non-supporting waters to calculate the maximum amount of pollutant(s) a creek can receive and still be healthy. This amount is known as a **Total Maximum Daily Load**, or TMDL, which can be thought of as a watershed diet.

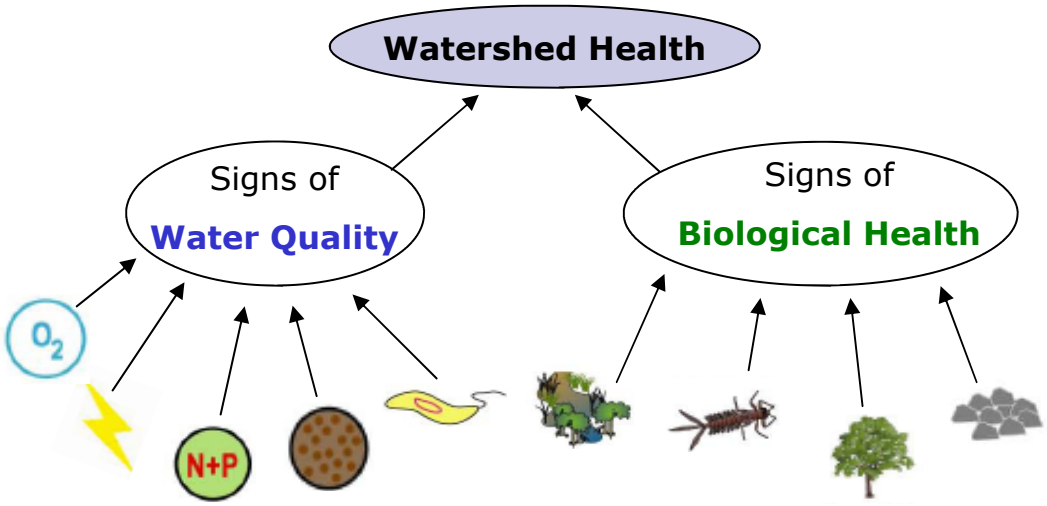
In 2011 DOW biologists conducted a watershed study of Muddy Creek to gather scientific information. Based on this information, DOW has given a "report card grade" of **C** to the **Muddy Creek Watershed**. This health report explains where the impaired segments are located, describes the signs of health that went into assigning the grades for each watershed and provides information on how the grades can be improved.

Additional Resources

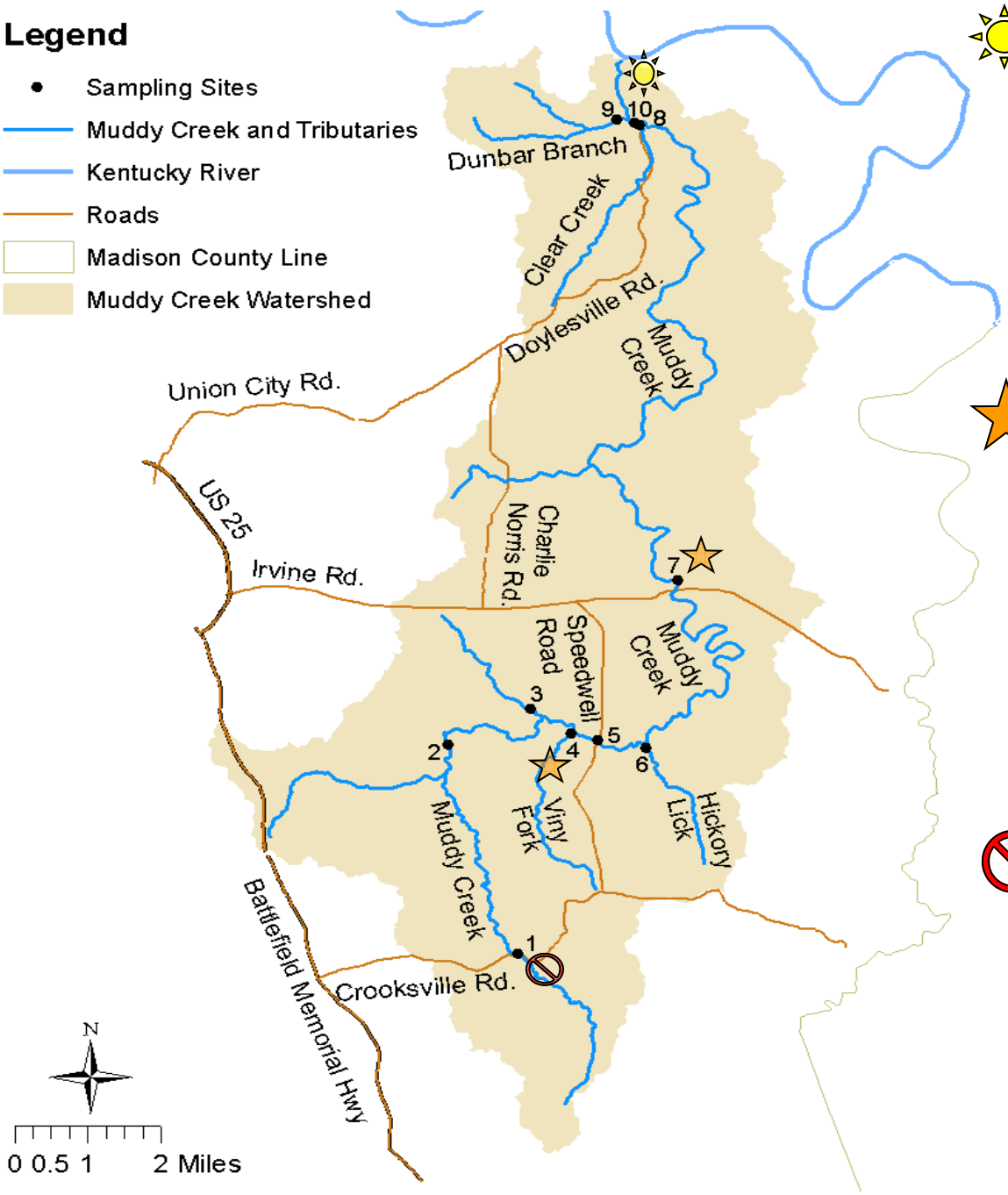
- **Like** "Kentucky Watershed Health Reports" on Facebook.
- Check out our webpage for all watershed Health Reports at http://water.ky.gov/waterquality/Pages/TMDLHealthReports.aspx
- Friends of Muddy Creek watershed group; contact Tom Edwards at tom.edwards07@yahoo.com
- **Making changes at home and work**: Bluegrass PRIDE at www.bgpride.org/gallery1.htm
- **Volunteering:** Watershed Watch in Kentucky at water.ky.gov/wsw/Pages/default.aspx or contact Jo Ann Palmer at 800-928-0045 or JoAnn.Palmer@ky.gov
- **What are other watersheds doing?**
  - ◊ Hinkston Creek Watershed Protection Project at http://www.hinkstoncreek.org/index.html
  - ◊ Strodes Creek Conservancy at http://www.strodescreek.org
  - ◊ Friends of Stoner Creek at http://www.stonercreek.us/
- **Grants and Programs**
  - ◊ KY's Nonpoint Source (Runoff) Pollution program: water.ky.gov/nsp/Pages/default.aspx
  - ◊ KY's Natural Resource Conservation Service: www.ky.nrcs.usda.gov/
  - ◊ KY's 319 Grant program: water.ky.gov/Funding/Pages/NonpointSource.aspx or contact James Roe at 502-564-3410 or James.Roe@ky.gov
  - ◊ Kentucky Agricultural Water Quality Act: http://www.bae.uky.edu/awqpt/background.htm

How was Muddy Creek Graded?

1. Information collected was divided into signs of **water quality** or signs of **biological health**.
2. Each sign received a grade, A through F, according to the results of our study, which were compared to health and science requirements and DOW scientific information.
3. The grades from each biological health sign were averaged to achieve a biological health score.



4. Similarly, each sign of water quality was averaged to achieve a water quality score.
5. These two scores were averaged to achieve a **watershed health grade.**



Best for Swimming: Site 10 (Muddy Creek at Doylesville Road bridge crossing) had the lowest average concentration of *E. coli.* About 78% of the time *E. coli* concentrations are well below the level considered unsafe. But, swim at your own risk after rain events when the water is murky.

Best in Show: Site 7 (Muddy Creek at KY-52 bridge crossing) and site 4 (Viny Fork on the Bluegrass Army Depot) tied for the highest site grade with a B-. Site 7 had the highest overall habitat score, while Site 4 had the widest riparian zone in the entire watershed. It's no surprise that some of the best bug populations were found at these 2 sites.

Worst in Show: Site 1 (Muddy Creek at Crooksville Road bridge crossing) had the lowest site grade with a D+. This site had the highest average *E. coli* concentration. Additionally, TSS and all biological health signs scored Ds. On the positive side, all other water quality signs were on par with the rest of the watershed.

Signs of Water Quality

Dissolved Oxygen (DO): Concentration of oxygen dissolved in water and readily available to fish and other aquatic organisms.

Specific Conductivity: A measure of the ability of water to conduct an electrical current, which is used for approximating the total dissolved solids content of water. Low specific conductivity is desired, and increasing specific conductivity negatively impacts fish and aquatic bugs.

Nitrogen and Phosphorus (Nutrients): Although natural sources of nutrients exist, human activity is a major source of nutrient pollution, including municipal sewage treatment plants, industrial outflows, commercial fertilizers and animal waste.

E. coli: A type of bacteria that lives in the intestinal tract of humans and other warm-blooded animals. To receive an A, and therefore not be impaired for Primary Contact Recreation (PCR), the *E. coli* concentrations were above the level considered safe for swimming 0—20% of the time. Grades B through F indicate an impairment for PCR and reflect *E. coli* levels that were above the standard 20—100% of the time.

Total Suspended Solids (TSS): A cloudy condition in water due to suspended silt or organic matter. As TSS increase, fish and aquatic bugs experience stress and altered behavior.

Signs of Biological Health

Total Habitat: Stream habitat is assessed by scoring 10 habitat signs, which are both living and nonliving parts of the surroundings that support an organism, population or community.

Aquatic Macroinvertebrates (bugs): An animal without a backbone, large enough to be seen with the naked eye. They are often the immature forms of insects that live on land as adults and are an important food source for fish. Different species prefer different habitats, and some are more tolerant of pollution than others.

Riparian Zone: A component of total habitat that is defined by the land adjacent to a stream that has distinct soil types and plant communities, which aid in absorbing water and shading the stream. To receive an A, the riparian zone must be at least 18 yards wide on each side of the stream.

Available Cover: A component of total habitat, which looks at the quantity and variety of structures in the creek that provide fish and aquatic bugs a place to hide, feed, reproduce and raise young. Examples include cobble and boulders, fallen trees, logs, branches, root mats, undercut banks and aquatic vegetation.

Site #	Creek Name	O_2		N+P							Site Grade
1	Muddy Creek	B	B	A-	F	D		D	D	D	**D+**
2	Muddy Creek	B	A-	A	D	C+	C	D	D	B	**C**
3	Muddy Creek Tributary	B	B	A	C	B-	C	D	D	C	**C**
4	Viny Fork	B	B	A	D	B-	B	D	D	A	**B-**
5	Muddy Creek	B	B+	A	D	C		D	F	D	**C-**
6	Hickory Lick	B+	B	B	F	C+	B	D	D	F	**C**
7	Muddy Creek	B	B+	B+	C+	C	B	C	C	C	**B-**
8	Clear Creek	B	B-	A	B-	B	C	D	C	C	**C+**
9	Dunbar Branch	B	B	B+	D-	A	C	D	C	C	**C+**
10	Muddy Creek	B	B+	A	B	C	B	D	C	D	**C+**
	Sign Grade	**B**	**B**	**A**	**D+**	**C+**	**C+**	**D**	**D+**	**C**	

Summary: An even spread from positive to negative

POSITIVES

Dissolved oxygen (DO) levels were suitable for fish and bugs most of the time. Some lower DO levels that lowered the average grade from an A to a B may have resulted from high levels of suspended sediment, which shades photosynthetic organisms and increases bacterial communities that consume oxygen.

Specific conductivity levels were reasonably low throughout the watershed, indicating a level of total dissolved solids that should not negatively impact the biological communities.

Nutrient levels were also low throughout the watershed, which demonstrates that nutrient inputs are not increasing due to human activities in the watershed.

GRAY AREA

Total Suspended Solids (TSS), on average, scored a C+. Some sites were worse than others, but in general, TSS levels rose following rain events indicating that exposed sediment was being washed into the stream.

The riparian zone was wide at a few sites (site 2 and 4), but overall, the riparian zone width was reduced to less than 10 yards to as narrow as 1 yard, while 18 yards is considered ideal.

While the water quality was suitable for **aquatic macroinvertebrates (bugs)**, the habitat and available cover were often lacking. As a result, the bugs communities were reduced to a level of 'fair' and scored a C+ on average.

NEGATIVES

E. coli levels were above the standard considered safe for swimming between 25% (B) and 85% (F) of the time, depending on the site. When *E. coli* levels are elevated, there is an increased risk of gastrointestinal illness if the water is swallowed or an infection if contact is made with an open sore or wound. Therefore, all of Muddy Creek and its tributaries are considered impaired for Primary Contact Recreation.

Available Cover was greatly reduced throughout the watershed, scoring Cs, Ds and 1 F. This cover is important for a healthy population of aquatic bugs and fish.

Total habitat was reduced throughout the watershed, with all but one site (7) scoring Ds. Total habitat is the base of the building blocks for a healthy population of aquatic organisms, and when it is reduced, biological health begins to degrade.

What can you do?

- Make every effort to **protect the good** that remains. Work with local government and land owners to protect areas that are less degraded and improve land management to minimize further degradation.
- **Trees are the best way to protect and restore water quality and biological health.**
  - ◊ Leave in place or establish vegetation alongside streams to provide natural filters that stabilize stream banks, minimize erosion, regulate water flow, provide shade, retain sediment and absorb excess nutrients.
  - ◊ Plant trees and do not mow within 18 yards of the stream bank.
- **To improve habitat**
  - ◊ Allow fallen trees, logs, leaves, gravel, cobble and boulders to remain in the stream to create habitat for fish and bugs to feed, find refuge and reproduce.
  - ◊ Minimize streamside and within stream grazing by animals.
  - ◊ Reduce sediment inputs (see 'To Reduce TSS').
- **To keep water safe for swimming**
  - ◊ Maintain functional septic systems and replace failing septic systems
  - ◊ Properly dispose of pet waste
  - ◊ Keep animals out of the stream
- **To reduce TSS**
  - ◊ Maintain streamside vegetation
  - ◊ Plant cover crops
  - ◊ Install settling ponds
  - ◊ Reduce animal access to streamside grazing
  - ◊ Guard waterways during construction activities
- **Other Tips**
  - ◊ Keep grass clippings and petroleum products out of storm drains; this material enters the stream directly without treatment.
  - ◊ Leave no trace: dispose of trash and recyclables properly.
  - ◊ Organize a creek clean-up to remove existing liter along and within Muddy Creek.
  - ◊ Service your vehicle regularly to prevent oil and antifreeze leaks and reduce noxious emissions.
- **Volunteer**
  - ◊ Become a certified citizen water quality monitor or join the Friends of Muddy Creek watershed group.
- **Education**
  - ◊ Check out some of the resources provided on the front page. Knowing how our daily actions affect water quality is half the battle to improving it.